

Carcinoma In Situ of the Colorectum: SEER Trends by Race, Gender, and Total Colorectal Cancer

RICHARD L. NELSON, MD,* VICTORIA PERSKY, MD, AND MARY TURYK, MS

Department of Surgery, College of Medicine, Epidemiology/Biometry Division, School of Public Health, University of Illinois at Chicago, Chicago, Illinois

Background and Objectives: To determine if Americans of African origin (blacks) have less access to colonoscopic polypectomy than Americans of European origin (whites), the rate of carcinoma in situ of the colorectum (CIS), a disease more similar to benign adenoma of the colorectum than invasive cancer in its symptomatology, discovery, and treatment, was determined in the United States from 1973 to 1994. The hypothesis being tested is that CIS will be far less common in blacks than in whites and that rates of CIS should be increasing in whites from 1973 to 1994.

Methods: CIS and invasive carcinoma of the colorectum incidence data were obtained from Surveillance, Epidemiology, and End Results (SEER) Public Use Files from 1973 through 1994. Rates were age adjusted and proportions determined by division of CIS rates for each subsite by total carcinoma rates, for each year, race, and gender. The colorectum was divided anatomically in this analysis at the junction of the descending and sigmoid colon.

Results: The relationships between male/female and black/white CIS incidence rates were broadly similar to invasive cancer rates over the 21 years of SEER, demonstrating a white male predominance for distal disease, a black male predominance for proximal disease, and a decline in incidence since 1988. CIS as a proportion of total colorectal cancer increased in all races and genders from 1973 to 1987, but then declined in all groups.

Conclusions: The majority of CIS is excised by endoscopic resection. Therefore, this might be considered a surrogate population for those individuals who have colonoscopic resection of benign adenomas. It is this latter treatment that has been hypothesized to be the cause for the declining incidence of invasive colorectal cancer. However, data presented herein do not support this hypothesis.

J. Surg. Oncol. 1999;71:123–129. © 1999 Wiley-Liss, Inc.

KEY WORDS: colorectal cancer in situ; race; gender; SEER

INTRODUCTION

In a recent time trend analysis correlating the pattern of declining colorectal cancer incidence (Figs. 1, 2) with evolving exposure to all suspected risk modifiers for colorectal cancer, it was hypothesized that colonoscopic polypectomy in the United States was the factor most responsible for the decline in colorectal cancer incidence

from 1985 to 1994 [1]. Changes in diet and food supplements, long hoped to be the most effective means of

*Correspondence to: Richard L. Nelson, MD, 1740 West Taylor, Room 2204 m/c 957, Chicago, IL 60612. Fax: (312) 996-2704. E-mail: Altohorn@uic.edu

Accepted 6 March 1999

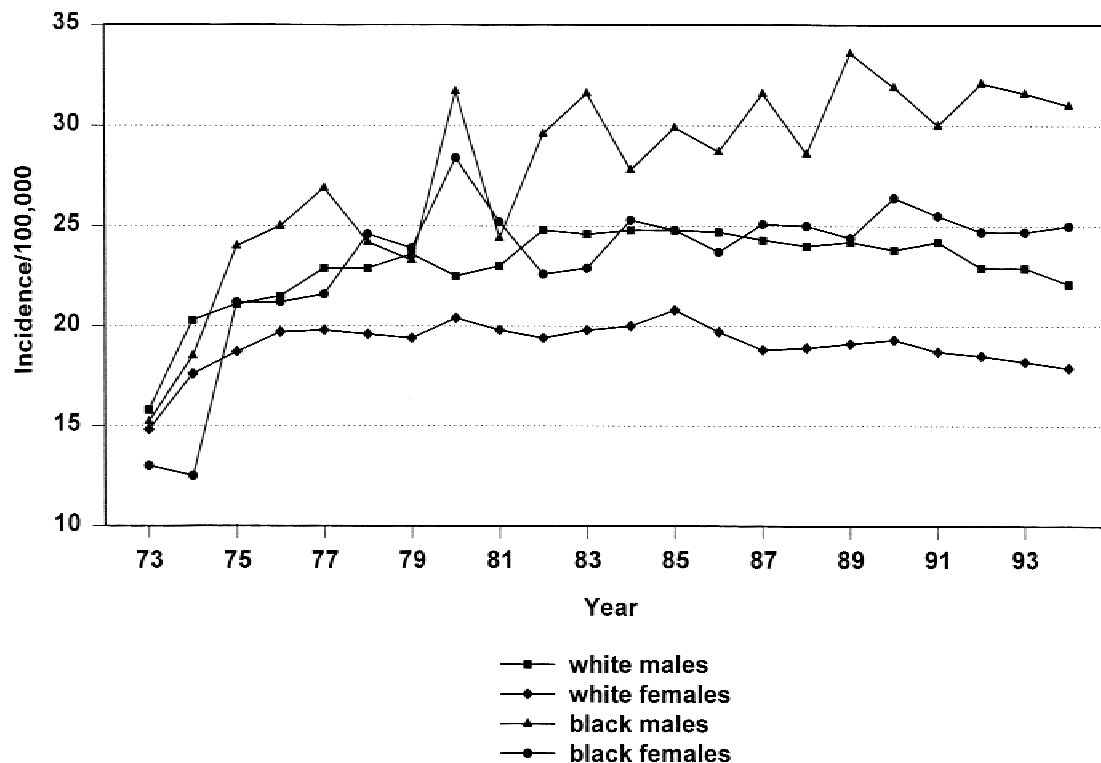


Fig. 1. SEER data (age adjusted) on proximal colorectal invasive cancer. Reprinted with permission of Richard L. Nelson, Victoria Persky, and Mary Turyk: Determination of factors responsible for declining incidents of colorectal cancer. *Diseases of the Colon & Rectum*, Vol. 42.

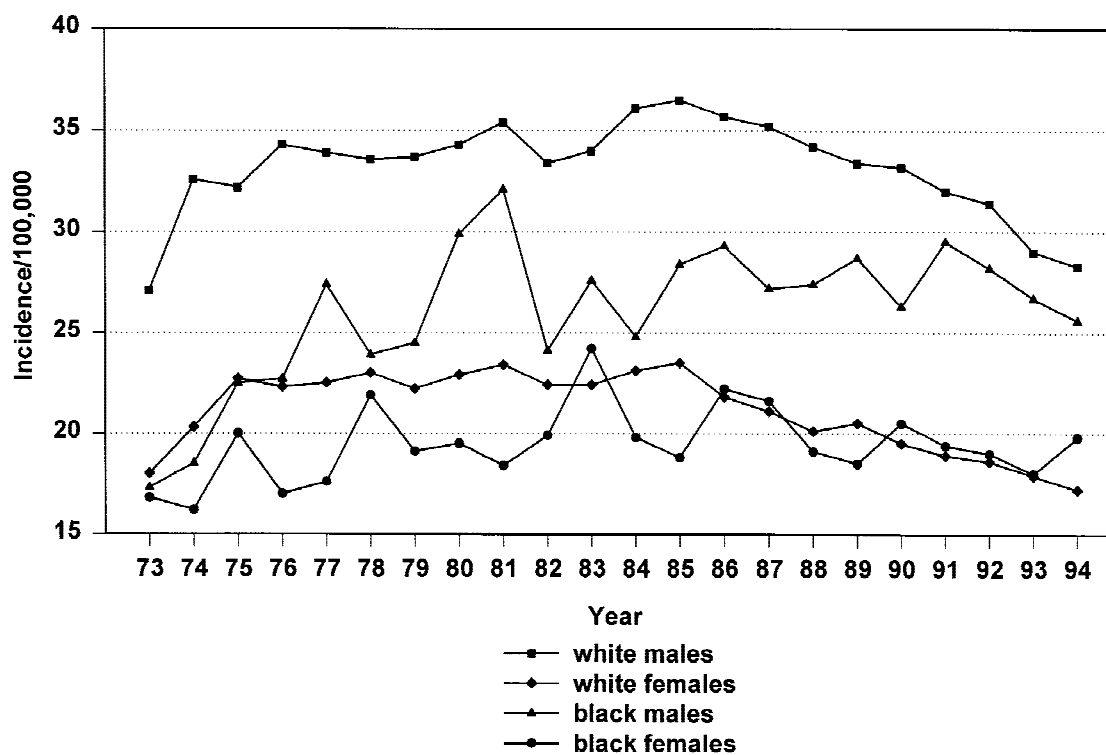


Fig. 2. SEER data (age adjusted) on distal colorectal invasive cancer. Reprinted with permission of Richard L. Nelson, Victoria Persky, and Mary Turyk: Determination of factors responsible for declining incidents of colorectal cancer. *Diseases of the Colon & Rectum*, Vol. 42.

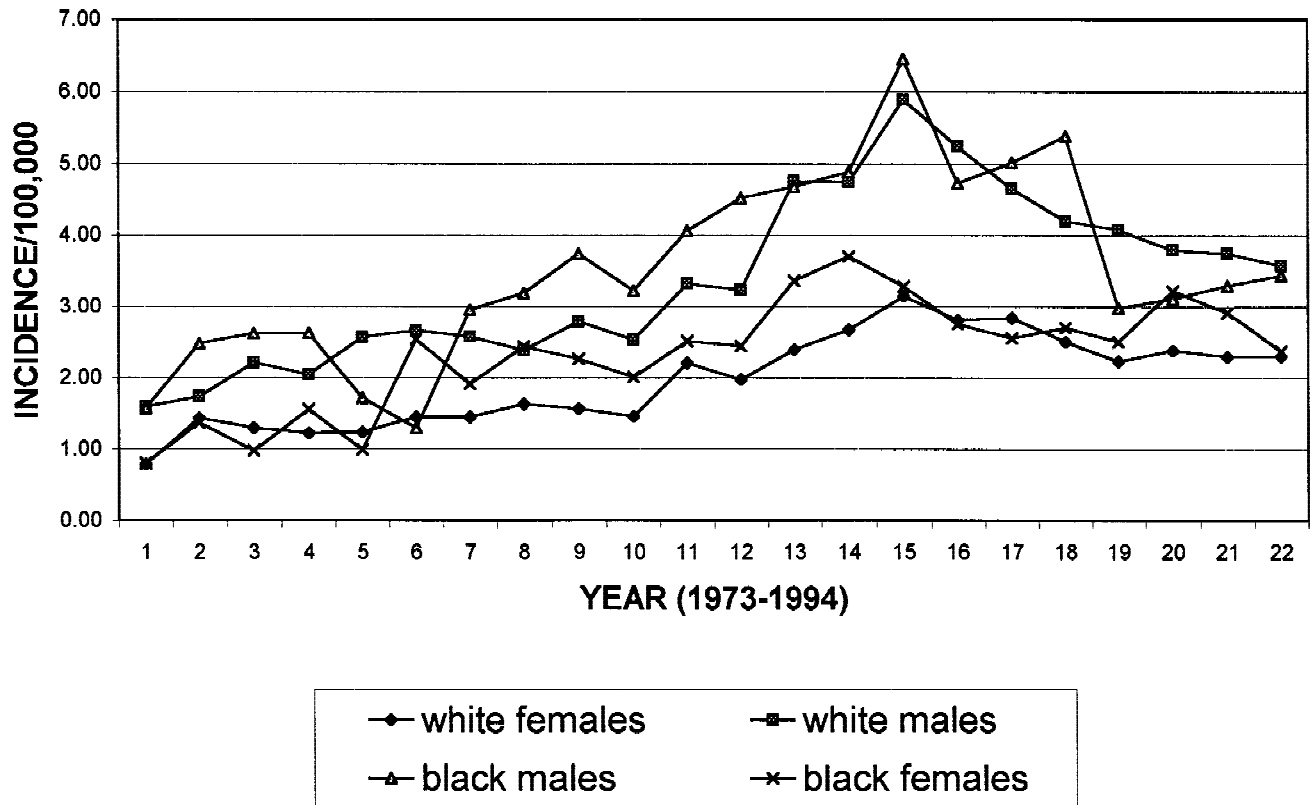


Fig. 3. SEER data (age adjusted) on total colorectal cancer in situ incidence rates.

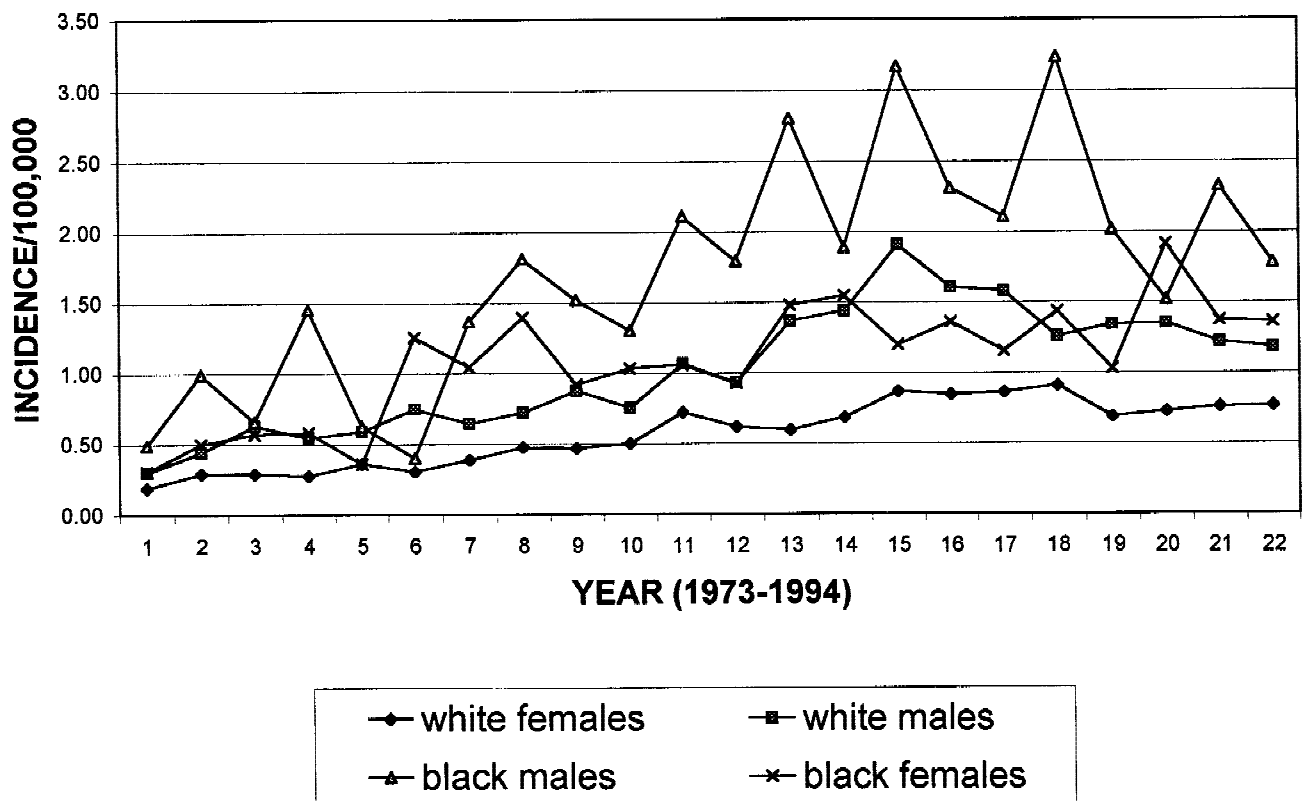


Fig. 4. SEER data (age adjusted) on proximal colorectal cancer in situ incidence rates.

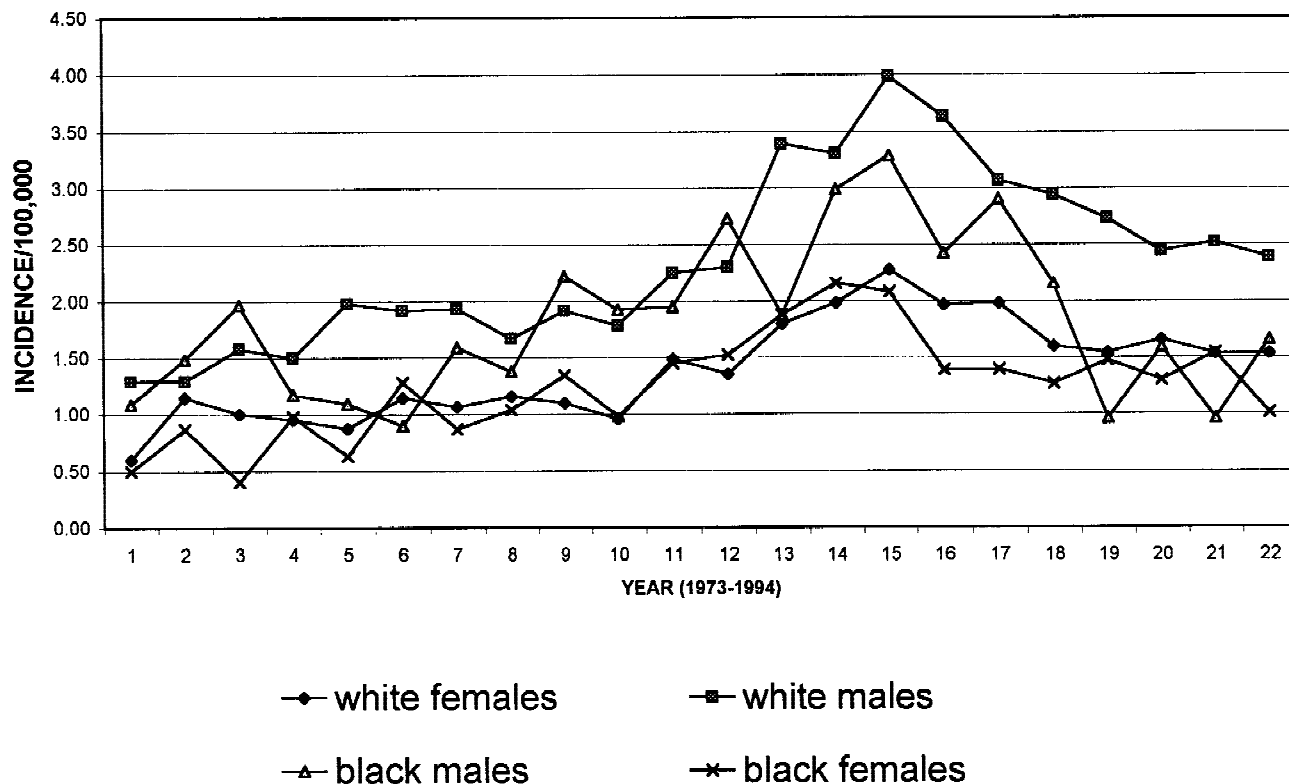


Fig. 5. SEER data (age adjusted) on distal colorectal cancer in situ incidence rates.

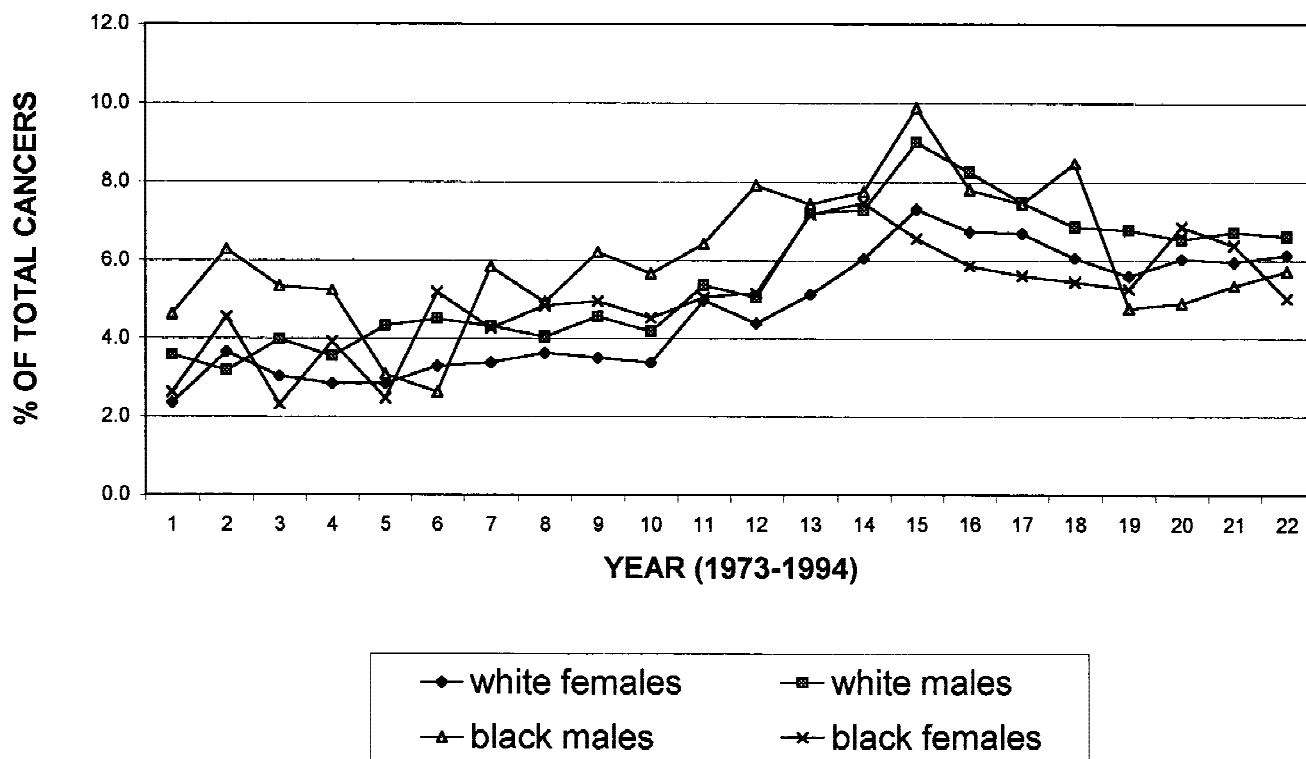


Fig. 6. SEER data (age adjusted) on the ratio of cancer in situ incidence divided by invasive colorectal cancer incidence.

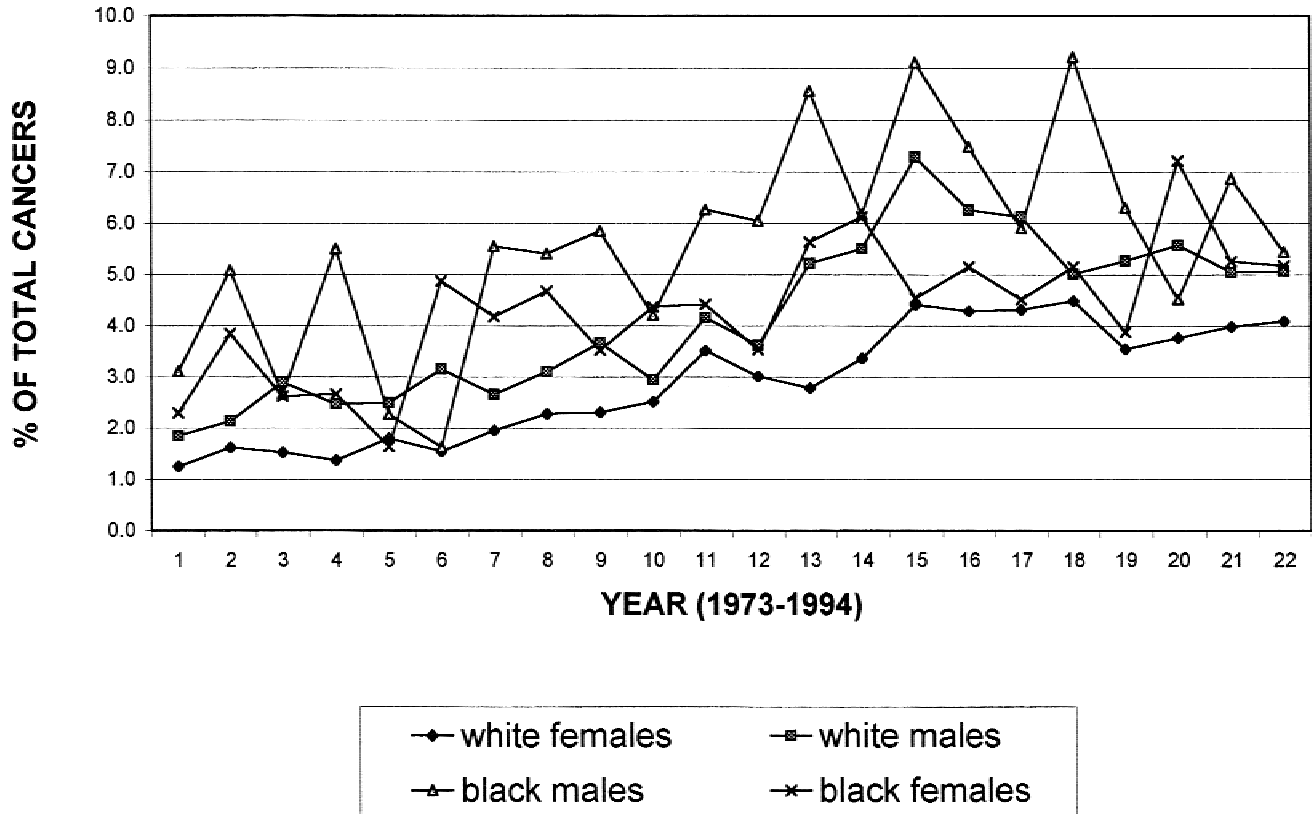


Fig. 7. SEER data (age adjusted) on the ratio of proximal cancer in situ incidence divided by invasive proximal colorectal cancer incidence.

diminishing risk, were not thought in the above analysis to have had a major effect on incidence either because the evolution over time was static or in the wrong direction (dietary fat, total calories, ethanol, calcium, obesity, or physical activity) or increases in exposure occurred too late to effect a change in the incidence curve beginning in 1985 (aspirin, estrogen). Apparently, dietary fiber, vitamin C, and vitamin A (all indicative of fruit, vegetable, and grain ingestion) did increase in the U.S. diet at a time that correlates well with the suspected lag time between altered exposure and incidence of clinical cancer (suspected to be at least 10–15 years). However, the pattern of observed change in colorectal cancer incidence, with the most significant decline being among whites in the distal colorectum (Fig. 2), was not characteristic of the reported lack of subsite specificity associated with increased fruit, vegetable, and grain intake, nor with the known differential evolution of intake of fruits, vegetables and grains between races and genders. In other words, colonoscopic polypectomy, which is known to provide the greatest protection against colorectal cancer in the distal colorectum, provided the best fit with the incidence data.

Because incidence of colorectal cancer has not declined in Americans of African origin (blacks), the necessary support for the above hypothesis are data demon-

strating that proportionately fewer blacks are subjected to colonoscopic polypectomy than Americans of European origin (whites), and that gender distribution is about equal. Population-based data of this type could not be found. Therefore, surrogates for these data were sought. The first of these were SEER (Surveillance, Epidemiology, and End Results; a cancer data and analysis program of the National Cancer Institute: <http://www-seer.ims.nci.nih.gov>) stage at diagnosis data of invasive colorectal cancer, it being assumed that earlier stage at diagnosis of colorectal cancer implied that the diagnosis was more likely to be made during screening of asymptomatic individuals rather than in response to symptoms of advanced disease, and therefore in a population more similar to those patients having polypectomy in the absence of cancer. In the report cited above, it was shown that in SEER, whites of both genders had a more localized disease at diagnosis than blacks, supporting the hypothesis [1].

In a further effort to find a surrogate for race/gender access to colonoscopic polypectomy, the incidence of carcinoma in situ of the colorectum (CIS) was determined by race and gender over the same SEER reporting period (1973–1994), and is reported herein. Specifically, the hypothesis being tested is that the incidence rate of CIS in blacks will be lower than in whites, that the pro-

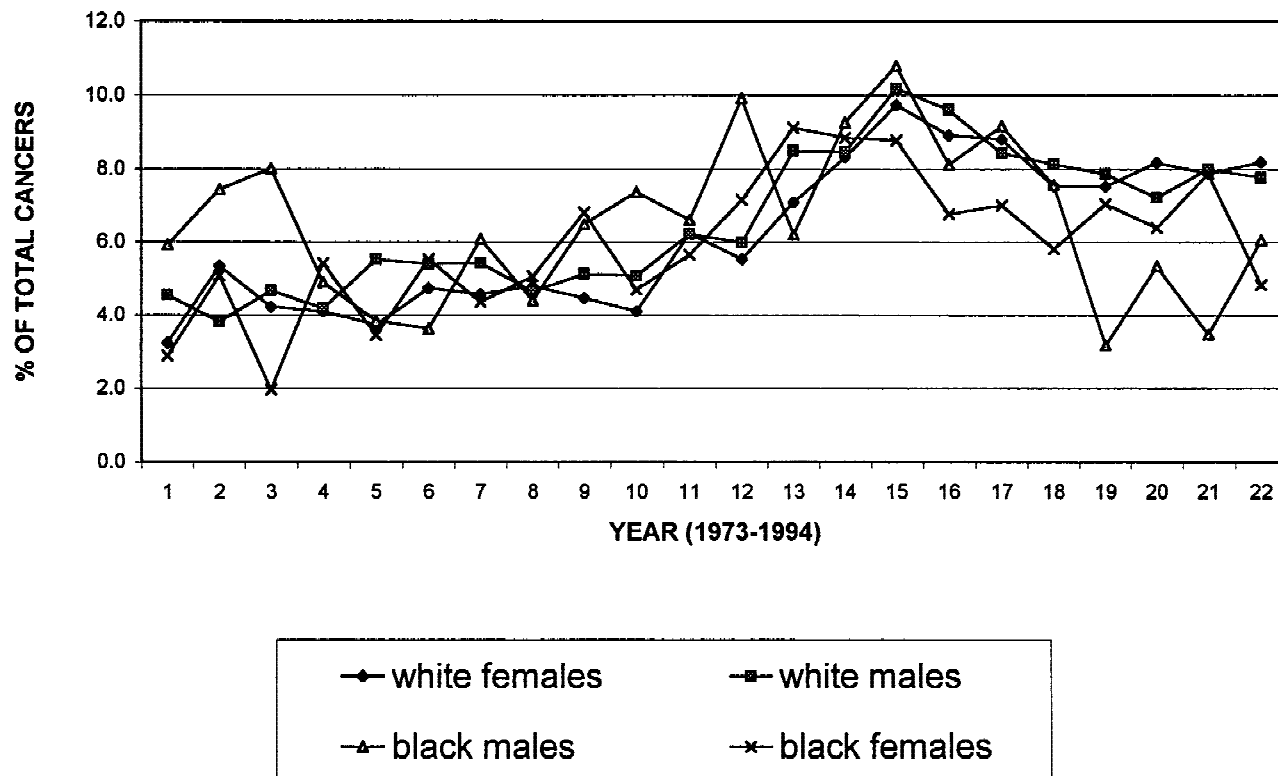


Fig. 8. SEER data (age adjusted) on the ratio of distal cancer in situ incidence divided by invasive distal colorectal cancer incidence.

portion of all colorectal cancer that is CIS will be even lower among blacks than in whites, and that the difference will have increased as the overall usage of colonoscopic polypectomy has increased in the United States, from 1973 to 1994.

MATERIALS AND METHODS

Data regarding CIS and invasive colorectal cancer incidence were obtained from the SEER Public Use Files for 1973–1994. Crude incidence rates were generated using CIS cases and population estimates from the nine standard SEER registries combined (the state of Connecticut, Iowa, New Mexico, Utah, Hawaii, and the metropolitan areas of Detroit, San Francisco, Seattle-Puget Sound, and Atlanta). Incidence rates, stratified by year of diagnosis, white or black race, subsite within the colorectum, and gender, were age adjusted in 5-year age increments using standard million population distributions from the SEER files. The colorectum was then divided anatomically for these analyses at the junction of the descending and sigmoid colon; i.e., proximal colon extended from the cecum through the descending colon and distal colon included the sigmoid, rectosigmoid and rectum. The rationale for this novel anatomic division is previously reported [2]. The anal canal was excluded as were tumors of site unspecified.

Frequency of polypectomy was estimated by deter-

mining the number of Medicare reimbursed polypectomies in the United States for various years, in data provided by the Health Care Finance Administration (HCFA), and the percentage of polypectomies done in Wisconsin in individuals over 65 years of age in 1993 in data provided by the Wisconsin Hospital Association Discharge Survey (both data sources unpublished) related to colonoscopic polypectomy.

The hypothesis that in situ colon cancer incidence decreased after 1987 was tested in multiple linear regression models after the data were stratified by gender and race. The models included a continuous variable for the year; a dummy variable, time, contrasting years 1988 and earlier and years after 1988; and an interaction term for year and time. The significance of the difference in incidence trends before vs. after 1988 will be reflected by the significance of the interaction term in the regression model.

RESULTS

The results are shown graphically in Figures 3–8 to display with greater clarity trends and relationships. The relationships between male/female and black/white CIS incidence rates were broadly similar to invasive cancer rates over the 21 years of SEER, demonstrating a white male predominance for distal disease, a black male predominance for proximal disease, and a decline in inci-

dence since 1988, seen best in the distal colorectum (Fig. 5). CIS as a proportion of total colorectal cancer increased in all races and genders from 1973 to 1987 but then declined, again seen best in the distal colorectum (Fig. 8).

Looking at total colorectal CIS, the difference in incidence before vs. after 1988 is statistically significant for both genders and racial groups ($P < 0.05$), whereas CIS as a proportion of all colorectal cancer also demonstrated a significant decline ($P < 0.05$) in a similar analysis in whites of both genders and black men, but not black women.

DISCUSSION

This analysis disclosed many interesting and unexpected relationships. A dominance of whites in CIS rates and proportions of all colorectal cancer was not observed throughout the period covered by SEER. In addition, a decline in the incidence of CIS began at about the same time as a decline in the incidence of invasive cancer. Like invasive cancer, there is also a clear dominance of risk for proximal CIS incidence in black males, though the dominance of risk in white males for distal CIS is less apparent than it is for invasive cancer.

What is to be made of each of these findings? The data initially sought for this study to investigate the hypothesis stated in the Introduction were population-based rates of access to colonoscopy and resection of benign adenomas for each race and gender. No such data could be found. SEER only collects data on malignant tumors. Billing records from various sources (HCFA or state hospital associations) have data on benign tumors but without race specificity. The surrogate sought, therefore, was non-invasive cancer, a term synonymous with carcinoma in situ and severe dysplasia, for which there are population-based data that allow rate calculation in SEER, with race and gender specificity. CIS is usually discovered in a polyp and is more likely to be resected during endoscopy than surgery [3], similar to benign adenomas. The failure to observe much lower rates and proportions of CIS up to 1988 in blacks when compared with whites would seem to refute the hypothesis that instigated this study. Blacks do have much lower rates and proportions of CIS in the distal colorectum in the latest years of the study, 1991–1994, which supports the hypothesis stated in the Introduction. However, this pattern will result in a change in cancer incidence only in the future and cannot be responsible for the change in cancer incidence seen in Figures 1 and 2. In addition, this pattern of CIS was not seen in the proximal colon.

The decline in CIS incidence since 1988, shortly after

a decline in invasive cancer, implies the effectiveness of same aspect of primary prevention (most probably a dietary factor) rather than secondary prevention (i.e., polypectomy). The previously reported time trend analysis suggested that the dietary factors most likely to be related to the declining incidence of colorectal cancer were fruits, vegetables, and cereals [1], a finding contrary to a recent report that saw no diminished risk associated with ingestion of dietary fiber [4]. Reasons to consider polypectomy ahead of these dietary factors were presented in that time trend report: first, a lack of subsite specificity in the colorectum for the effect of fruit, vegetables, and cereals on cancer risk in previous reports, and second, lack of a clear difference in ingestion patterns between races [1]. Third, it seemed a safe assumption that blacks have less access to screening and preventive health care in the United States. The invasive cancer data support that.

An alternative explanation for the patterns seen in Figures 5 and 8 is that CIS as well as invasive cancer might be prevented by endoscopic resection of benign adenomas. As the number of people having polypectomy has increased rapidly in the United States in the past 20 years, from anecdotal cases to almost 1 million individuals in 1993, an effect on invasive cancer incidence as well as CIS incidence might be expected. However, contrary to the invasive cancer and stage at diagnosis data, blacks have shown a decline in CIS in the distal colorectum (Fig. 8). In the absence of race- and gender-specific polypectomy data, what remains is a conundrum of disparate inferential data on black access to polypectomy and dietary patterns cited above that are not clearly different between races. The reason for the declining incidence of colorectal cancer in the United States therefore is still not clear, though perhaps the field of choices has at least been narrowed.

There are several diseases that appear to be greatly increased in black males, a list to which proximal colon neoplasia can be added. We have as yet no explanation to suggest for this association. This is a very fruitful area for research.

REFERENCES

1. Nelson RL, Persky V, Turyk M: Determination of factors responsible for the declining incidence of colorectal cancer. *Dis Colon Rectum* (in press).
2. Nelson RL: Division of the colorectum into anatomic subsites: Why and where? *J Surg Oncol* 1998;69:1–3.
3. Nusko G, Mansmann U, Altendorf-Hormann A, et al.: Differences between colorectal adenomas removed endoscopically and surgically. *Hepatogastroenterology* 1997;44:1063–1068.
4. Fuchs CS, Giovannuscii EL, Colditz GA, et al.: Dietary fiber and the risk of colorectal cancer and adenoma in women. *N Engl J Med* 1999;340:169–176.